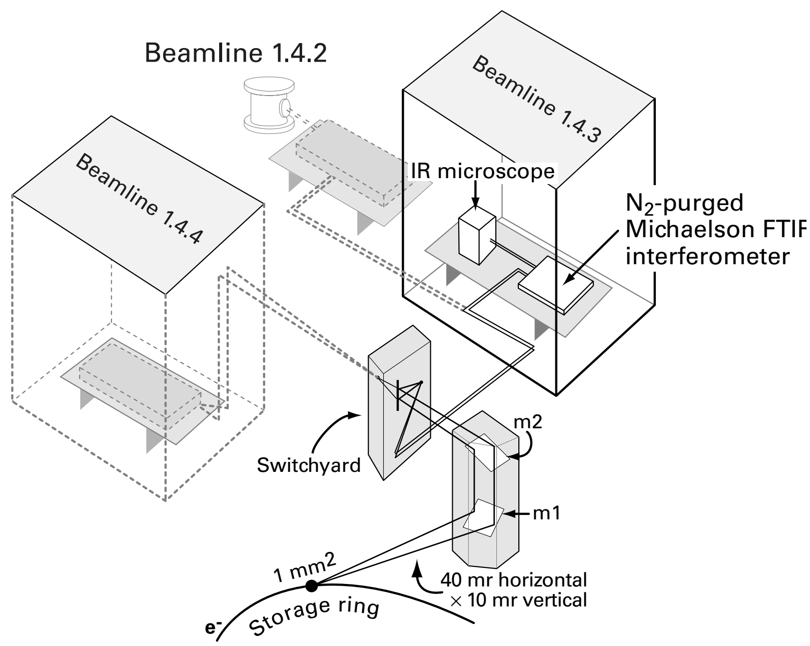
Infrared Spectromicroscopy (FTIRSM) • Beamline 1.4.3

Berkeley Lab • University of California

Beamline Specifications

Photon Energy Range (cm^{-1})	Spectral Resolution (cm^{-1})	Spot Size (µm)	Availability
200–10,000 (0.02–1 eV)	0.125	<10 (diffraction limited)	NOW



Schematic layout *of Beamline 1.4.3.*

Beamline 1.4 serves three distinct experimental stations designated as Beamlines 1.4.2, 1.4.3, and 1.4.4. Beamline 1.4.3 provides state-of-the-art Fourier transform infrared (FTIR) spectro-micro-scopy in the mid-IR region from 10,000 to 200 cm^{-1}. All-reflecting optics focus the bend-magnet radiation into a switchyard. The switchyard houses optics that collimate the radiation and distribute it to the three experimental stations.

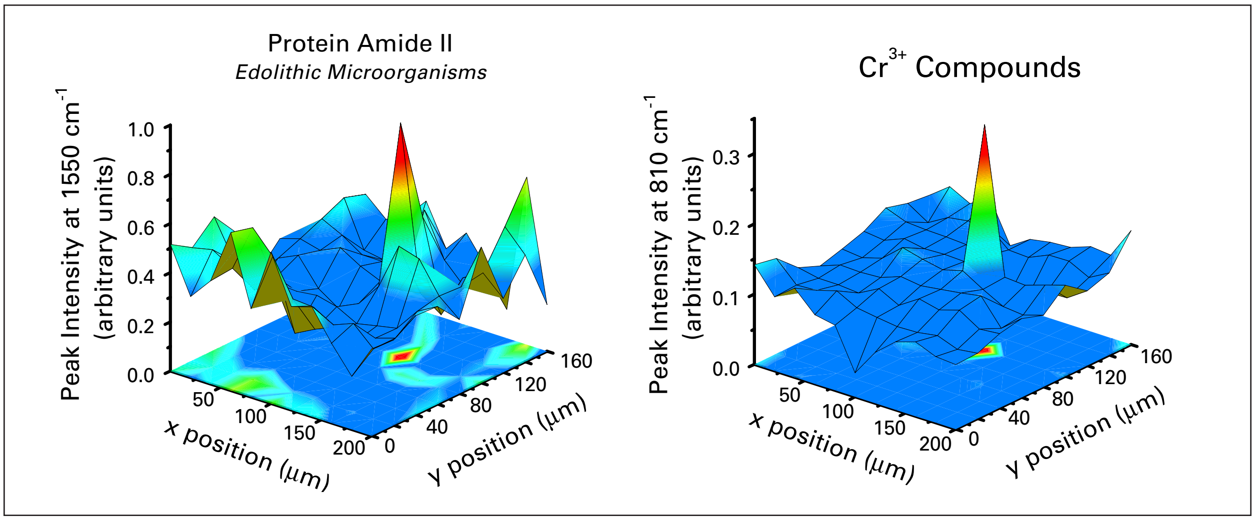
The synchrotron beam serves as an external source for a Nicolet Magna 760 FTIR bench. The beam, after being modulated by the moving mirror in the Michaelson interferometer in the 760, passes into a Nicolet Nic-Plan IR microscope. The Nic-Plan has two all-reflecting objectives, 15× and 32×, which allow both reflecting and transmitting modes of operation. A grazing-incidence objective and a variable-temperature stage (70–730 K) are available. A computer-controlled, motorized sample stage can obtain spectral maps with 1-µm spatial precision.

Since the synchrotron beam is many times brighter than conventional IR sources, the beam may be focused to small diameters with little loss of signal. With the 32× objective, the full-width, half-maximum (FWHM) spot size, integrated over all

7/03

mid-IR wavelengths, is less than 10 μm. This spot size becomes diffraction limited at longer wavelengths. When measuring areas with diameters less than 100 μm, the synchrotron provides substantial improvement in signal over the conventional globar source.

Typical experiments are in environmental science (adsorbates, bacteria, soil chemistry, remediation), particulate contamination (defects on silicon wafers), biological materials (bioremediation, identification of biomolecules, tissue analysis), microscopic films and crystals (novel electronic materials and molecules), polymer laminates and composites (photographic film), forensic studies (drug identification, fiber analysis), and systems at high pressure (materials in diamond anvil cells). Visit *infrared.als.lbl.gov* for more information. ■



Spatially resolved, time-dependent evidence *for biogeochemical transformation of hexavalent chromium (Cr^{6+}), a widespread industrial contaminant. After a four-month exposure of basalt rock chips to solutons of Cr^{6+} and toluene vapor, FTIR spectromicroscopy showed that Cr^{6+}-tolerant and Cr^{6+}-reducing microorganisms were thriving in association with Cr^{3+}. Data courtesy of Hoi-Ying Holman, Dale L. Perry, Michael C. Martin, Wayne R. McKinney (Berkeley Lab), and Jennie C. Hunter-Cevera (University of Maryland).*

To obtain a proposal form, go to www-als.lbl.gov/als/quickguide/independinvest.html.

For Beamline Information

Michael C. Martin
Advanced Light Source
Berkeley Lab, MS 6R2100
Berkeley, CA 94720
Phone: (510) 495-2231
Fax (510) 495-2067
Email: mcmartin@lbl.gov

Spokesperson

Wayne R. McKinney
Advanced Light Source
Berkeley Lab, MS 2R0400
Berkeley, CA 94720
Phone: (510) 486-4395
Fax: (510) 486-7696
Email: wrmckinney@lbl.gov

BERKELEY LAB

7/03